PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Improvements in Building Construction.

I, ARTHUR RAYMOND WYLIE, a citizen of the United States of America, residing at 634, Hinman Avenue, City of Evanston, County of Cook, State of Illinois, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to improvements in the art of building construction.

An object of this invention is to provide a reinforced concrete building having a floor construction wherein the stresses are reduced to a minimum for a given column spacing and loading.

Another object is the provision in a reinforced concrete building of novel supporting means for the outer walls and of the floors adjacent thereto whereby the outer walls and the floor portions adjacent thereto are carried by cantilever structures which serve to neutralize the stresses in the columns by the other floor carrying members.

The present invention consists in a building construction comprising in combination, spaced floors, supporting columns arranged in spaced relation between the floors and extending from floor to floor, floor carrying arched beams extending continuously from column to column at each of the floors, and a floor slab integral with and carried directly on said arched beams.

Substantially all of the parts of the floor and arch structures of a reinforced concrete building construction embodying the present invention are in compression, thereby largely eliminating the necessity for a great amount of steel reinforcement. In order to reduce the size of the floor span between the supporting columns, the arch structures are made to run diagonally from column to column, and, as a preference, in two directions, one at right angles to the other, and thereby intersecting each other midway between the columns. In order to locate the outer wall of the building at a considerable distance beyond the outermost columns, floor carrying cantilever structures are provided upon the columns in the form of continuations of the arch structures, said cantilever structures, except those at the corners of the building, also intersecting each other, as a preference, and serving to carry that portion of the floor located beyond the outermost columns.

The foregoing and other objects and advantages, as will hereinafter appear, are accomplished by this invention which is fully described in this specification and shown in the accompanying drawings in which:

Figure 1 is a vertical section taken diagonally through a building construction embodying a simple form of the present invention, the line of section being indicated at 1—1 in Fig. 2; and

Figure 2 is a view thereof, partly in plan and partly in horizontal section, the line of section being indicated at 2—2 in Fig. 1.

Referring more particularly to the accompanying drawing, the reference characters 11 designate the supporting columns of the building. The supporting columns extend up from suitable footings or foundations 11^a and support the entire weight of the building, although the outermost rows of columns are disposed a considerable distance away from the outer walls 10, 10^a of the building, as shown. The columns are suitably spaced apart, and because of the great load carrying properties of the arch construction of the floors, may be safely spaced from eighteen to twenty-four feet apart or thereabouts.

Extending diagonally from column to column are the arched beams 13, herein generally referred to as arches and, as a preference, certain of said arches may run in one direction and the others in a direction at right angles thereto, thereby intersecting each other midway between the columns, as at 14. Projecting beyond the outermost columns are cantilever arched beam structures 15 which form continuations of the arch structures 13 and, as a preference, meet or intersect each other at the outer walls of the building, as at 16. At the corners of the building, the cantilever structures 15 do not intersect with other cantilever structures, but run directly to the corners of the building.

[*Price* 1/-]

The floor 17 of the building and its associated arches 13 are integral monolithic structures, the floor slab forming the upper part of the arches. The floor slab is supported by the arch structures 13 and cantilever structures 15 and run to the outer walls. At the sides of the building, which face upon streets, or other open spaces, low walls or curbs 10^a are provided along the marginal edges of the floors, thereby leaving free spaces above each floor in which may be placed windows that extend throughout the entire length and breadth of the building. In case one side of the building is contiguous with another building, indicated at A, the outer wall 10 may extend from floor to floor and is carried by the cantilever structures 15 along that side of the building. If desired the first floor wall may be brought back to the first line of columns so that trucks may back under cover to be loaded or unloaded.

It will be observed that all of the footings or foundations 11^a of the building are disposed at a considerable distance away from the outer walls of the building. When placed contiguous with another building, the footings for the adjacent outer wall need only be of sufficient extent to carry the basement wall 10^b. In order to compensate for any unevenness in the settling of the building, and to prevent any reverse action on the cantilever structure, a slight space 18 is left between the basement wall 10^b and the remainder of the structure, which space is filled with a plastic cement or other suitable material. This permits the columns and parts of the building carried thereby to settle independently of the outer basement walls.

The invention has been illustrated in connection with a monolithic reinforced concrete building construction of which metal reinforcement rods 19 and 20 are embedded in the concrete arch structures and cantilever structures to reinforce the same. These longitudinal reinforcing rods extend through the columns and the lower reinforcing rods 20 continue down beyond the curved ends of the intrados of the arches and are anchored in the columns below the arches. The floors 17 may also be composed of concrete, and in such cases are usually reinforced by reinforcement rods 21 which are disposed in various manners well known in this art. Other reinforcing rods (not shown) may be used to connect the upper and lower rods 19, 20 in the arches. These arched beams may be of constant or varying cross section. Reinforcement rods 22 are also employed in the supporting columns, as is customary. It will be understood that in constructing a monolithic reinforced concrete building containing the present invention, suitable forms are employed for giving shape to the columns, floors, arch structures, cantilever structures and walls, and that the reinforcement rods are placed in the forms and the concrete poured around them in the usual manner.

Thus it will be seen that by using this combination of flat slab and integral monolithic arched beam construction, the stresses are nearly all transferred to the columns as compression stresses. As a result they are capable of much more accurate calculation than in any of the forms of reinforced concrete construction now in use. Moreover, by thus relieving the structure very largely of tensile strains a building may be constructed to carry a given load with much less concrete and steel than has heretofore been considered possible.

Moreover, by supporting the floor slab on arched beams formed integral therewith extending diagonally from column to column, the load is first transferred to the arches and by them to the columns. The purpose of this is, first, to transfer the floor loads to the columns in a manner requiring the least material and which produces the least possible stresses; second, to give a type of construction where stresses can be calculated definitely, which is not true of a flat slab, because the stresses therein are indeterminate and the empirical methods employed in calculating the same are largely because of the highly complicated character of the stresses which do not permit of accurate mathematical statement; third, to provide a structure which is more rigid than a flat slab and when wind stresses must be considered, they can be definitely calculated and provided for more effectively; and, fourth, to have a type of construction which will better resist vibrations resulting from operation of heavy machinery.

From the above it is apparent that all of the columns may be spaced away from the outer walls of the building and that the columns may be widely spaced. Because of the great load carrying properties of the arch structures and cantilever structures when arranged diagonally of the building, the size of the floor panels is materially reduced, thereby making it possible to employ a minimum amount of metal reinforcement for the concrete in the entire building. The floor slabs being carried by monolithic arch structures, the vertical pressure is transferred from slab to arch and this is resolved into horizontal or diagonal thrust, the action in an arch on one side of a column being neutralized by that in the arch on the opposite side of the column, and at the

outermost rows of columns, the action is neutralized in a great measure by the action of the cantilever structures. For this reason, any bending strain upon the column caused by the outermost arches of the building is counteracted by the cantilever structures on the other sides of the columns. Consequently, on account of the neutralizing action of the cantilever structures, little or no extra reinforcement is required to guard against any bending action which might otherwise be occasioned by the arch structures.

It will also be observed that the outer walls of the building are located at a considerable distance beyond the columns, which arrangement leaves free space for windows throughout the extent of the sides of the building. Furthermore, all of the footings or foundations are located entirely within the confines of the outer walls of the buiding, and the usual heavy footings ordinarily provided for columns at the outer walls of the building are eliminated. It is to be understood that the outer walls may comprise in addition to the concrete curb 10^a at each floor, other wall portions composed of masonry, windows, or other elements for completing the enclosure, and that in place of the curb 10^a a reinforced concrete rib 10^e may be formed on the underside of the floor at its marginal edge so as to reinforce the floor slab at its edge, or the rib may extend both above and below the slab.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. A building construction comprising in combination, spaced floors, supporting columns arranged in spaced relation between the floors and extending from floor to floor, floor carrying arched beams extending continuously from column to column at each of the floors, and a floor slab integral with and carried directly by said arched beams.

2. The building construction as defined in claim 1, characterized by certain of said arched beams being arranged transversely of the others and obliquely of the building and defining panels of less area than the areas between adjacent columns.

3. The building construction as defined by claims 1 or 2, characterized by the slab forming the upper part of the arched beams and integral therewith.

4. The building construction as defined by any of the preceding claims, characterized by there being longitudinally extending metal reinforcements adjacent the intrados and extrados of the arched beams.

5. The building construction as defined by any of the preceding claims, characterized by all the columns being spaced inwardly from the sides of the building forming, at the sides, floor carrying cantilever structures which are continuations of said arched beams and slabs.

6. The building construction according to claim 5, characterized by said cantilever structures carrying the side walls of the building.

7. The building construction as defined in claims 5 or 6, characterized by said cantilever structure being reinforced along the outer edge by a rib extending above or below the slab or both.

8. A building construction substantially as hereinbefore described with reference to the accompanying drawings.

Dated this 4th day of April, 1932.

MARKS & CLERK.

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Fig. 1

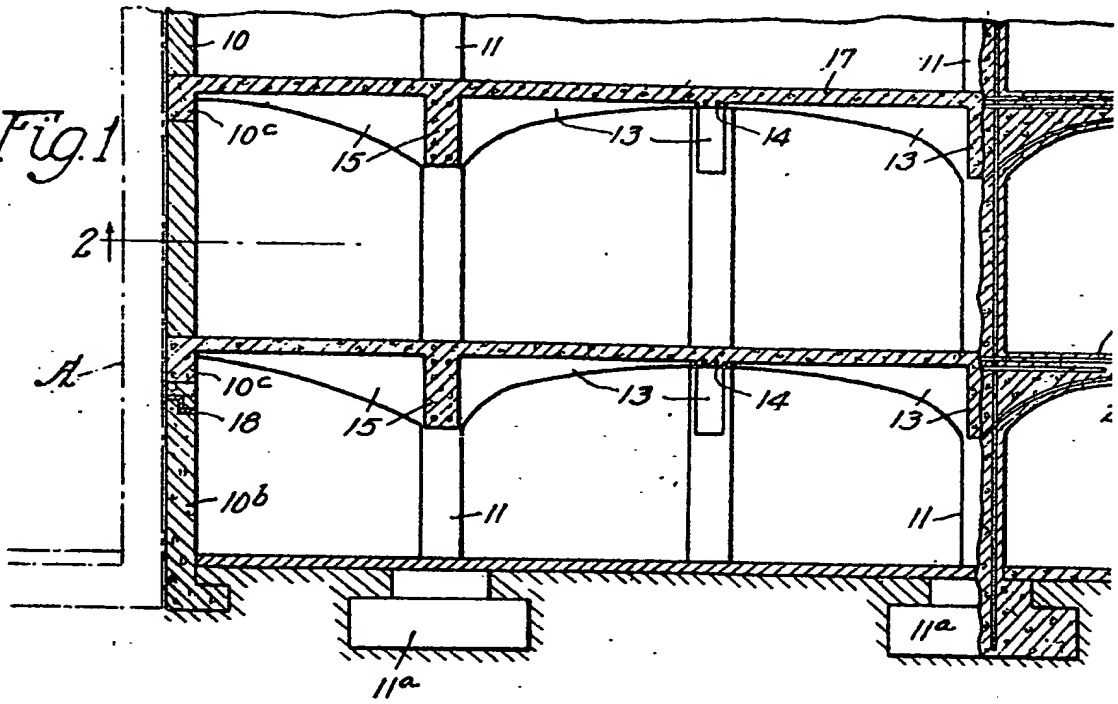
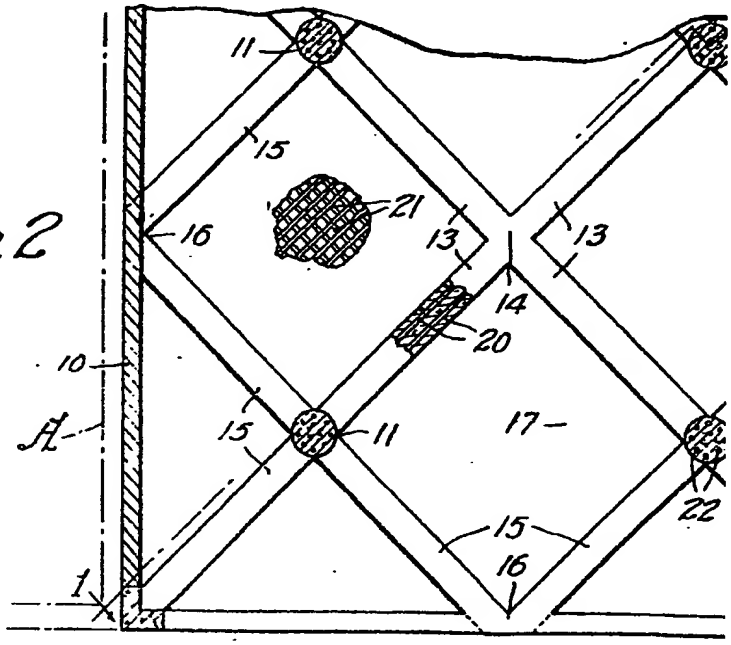
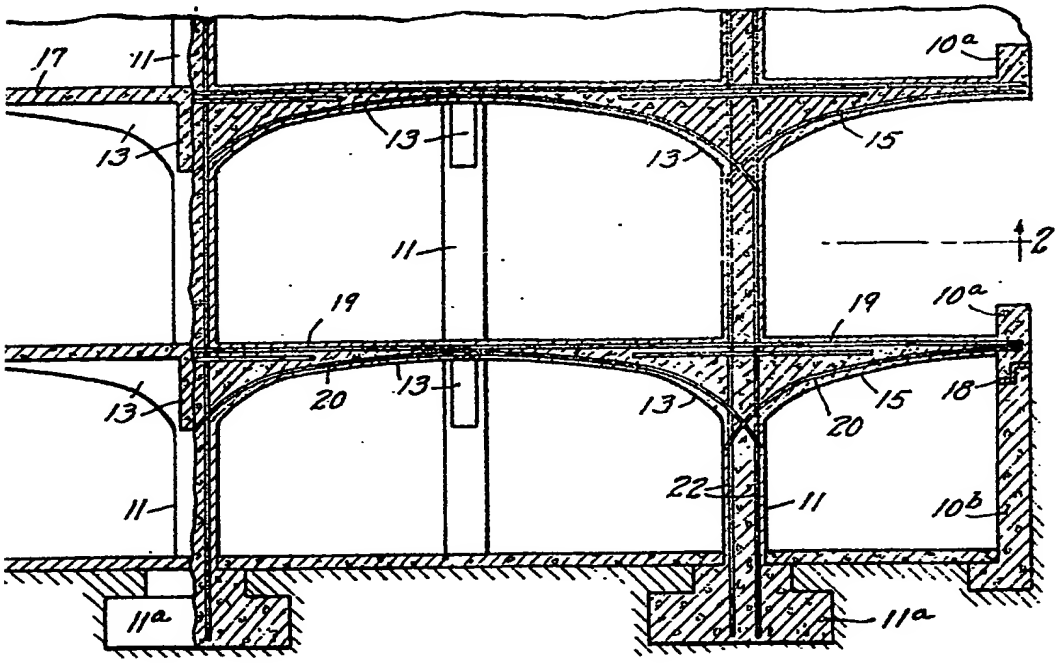


Fig. 2





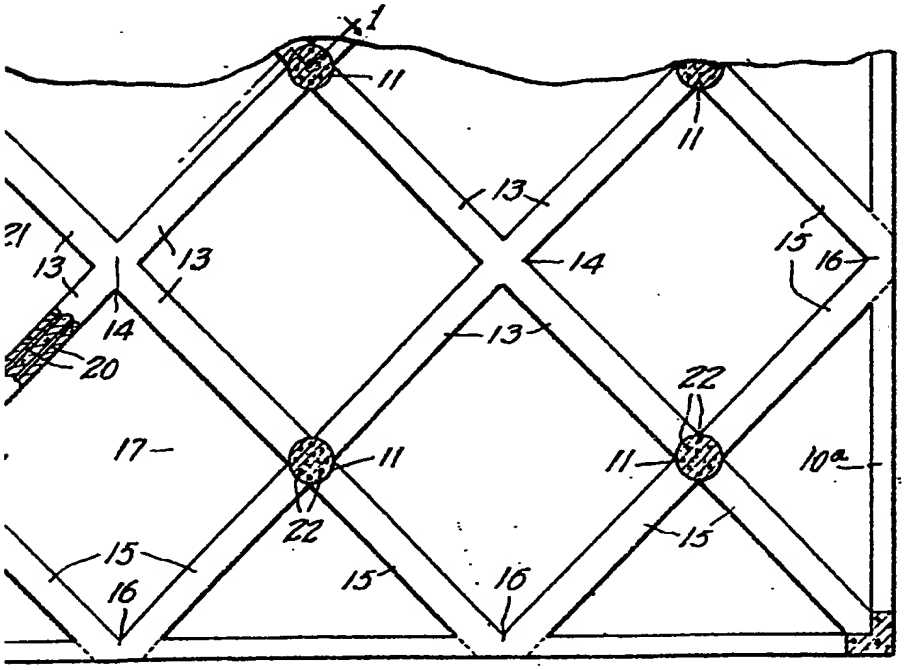


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Fig. 1

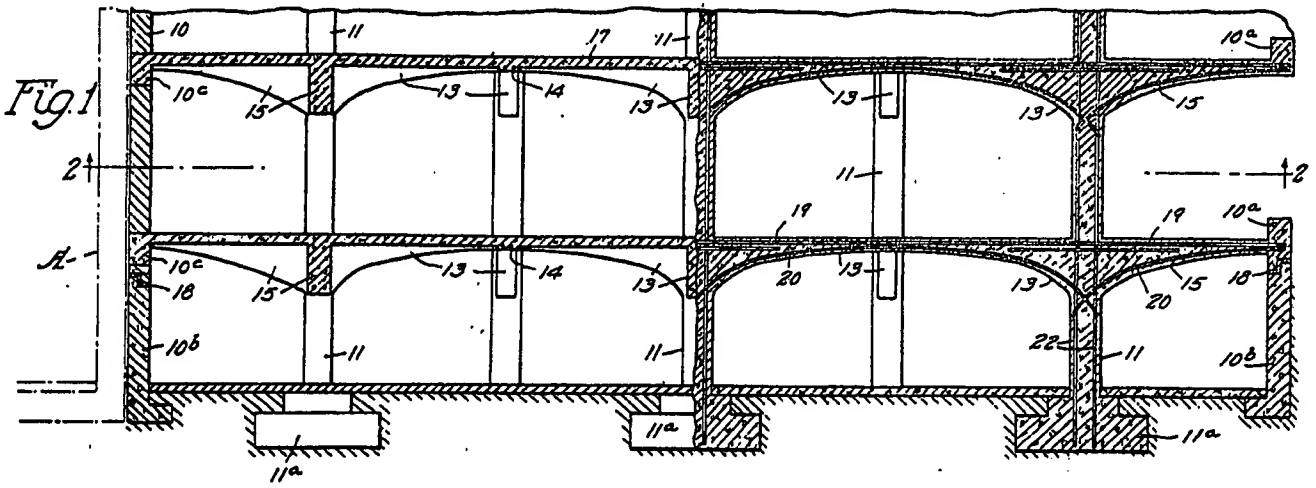
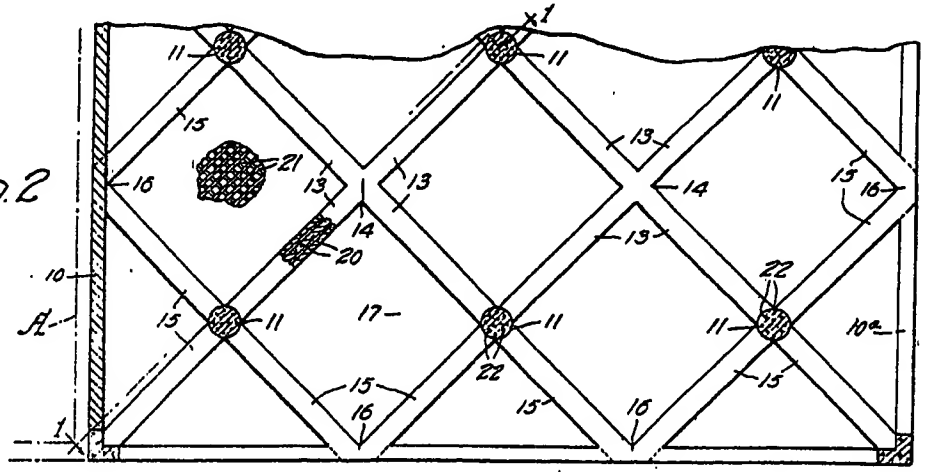


Fig. 2



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